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10/549,632	09/20/2005	Herbert Thanner	66376-364-7	8066

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DYKEMA GOSSETT PLLC
FRANKLIN SQUARE, THIRD FLOOR WEST
1300 I STREET, NW
WASHINGTON, DC 20005

EXAMINER	
SAINT SURIN, JACQUES M	

ART UNIT	PAPER NUMBER
2856	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/549,632	THANNER, HERBERT	
	Examiner	Art Unit	
	J M. SAINT SURIN	2856	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The preliminary amendment of 05/19/06 is acknowledged, considered and entered.

Drawings

2. The drawings filed on 09/20/05 are accepted by the Examiner.

Claim Objections

Claim 42 recites the limitation "chemically stable coating" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

In addition, the preamble of a claim should begin with the prefix (A or The).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 37 is rejected under 35 U.S.C. 102(b) as being anticipated by Schonfeld et al. (US Patent 5,958,787).

Regarding claim 37, Schonfeld discloses a piezoelectric sensor device (20) for determining the redox state (intended use, therefore, no patentable weight) of an oxidizable and reducible coating (12), wherein the oxidizable and reducible coating (12) is applied to the surface of at least one first resonator (11) of the sensor device (20)

the resonator surface being flow-connected (col. 5, lines 17-18) to the anode gas space of a high-temperature fuel cell (10) or the gas space of a reformer.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 22-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (US Patent 5,827,947) in view of Hallum (US Patent 6,455,181).

Regarding claims 22, 28 and 37, Miller discloses a method for determining the redox state of an anode of a high-temperature fuel cell (20) or a reaction surface of a reformer, which anode or reaction surface is in contact with a gas flow (col. 13, lines 5-11) containing at least one of H.sub.2, CO and CH.sub.4 and is coated with or made from a catalyst material, comprising the steps of:

bringing at least a first resonator (38) of a piezoelectric sensor device (36) into contact with said gas flow (col. 15, line 3) of said high-temperature fuel cell (20) or said reformer, a surface of the first resonator being furnished with a coating which is oxidized or reduced in said gas flow (col. 17, lines 1-7);

measuring at least one change in the resonance properties of the first resonator, and inferring the redox state from a change of the resonance properties of the first resonator (col. 4, lines 24-27). Note that Table 2 shows redox reactions in col. 12, lines 12-20. However, Miller does not particularly disclose inferring the redox state of the

anode of the fuel cell from a change of the resonance properties of the first resonator. Hallum discloses a fuel cell system 20 having an anode gas supply 35, an anode gas inlet 40 and an anode gas outlet line 50 (col. 4, line 66 to col. 5, line 1). It would have been obvious to one of the ordinary skill in the art at the time of the invention to utilize in Miller the fuel cell of Hallum because the fuel cell include one or more sensors to detect the difference in the content of a gas (e.g.,) hydrogen in an inlet stream and an outlet stream of the fuel cell system. Therefore, one of the ordinary skill in the art using the above combination would be motivated to recognize that the redox state of the anode of the fuel cell would be effectively determined based on the frequency changes in the piezoelectric crystal following contact with the gas flow in a reliable manner.

Regarding claim 28, it is similar in scope with claim 22 and therefore, it is rejected for the reasons set forth for that claim. Regarding claim 37, it is rejected for the reasons set forth for claim 22.

Regarding claim 23, Miller in view of Hallum discloses a method according to claim 22, wherein a change in the resonance frequency of the first resonator is measured (col. 9, lines 32-36 of Miller).

Regarding claim 24, Miller in view of Hallum discloses a method according to claim 22, wherein depending on the measured change of resonance properties, at least one operational parameter of the high-temperature fuel cell or the reformer is controlled or adjusted (col. 13, lines 5-11 of Miller).

Regarding claims 25-26 and 31-32, Miller does not disclose at least one second resonator (182) of the piezoelectric sensor device (180) is brought into contact with the

gas flow containing at least one of H.sub.2, CO and CH.sub.4, said second resonator (182) having a coating which is chemically stable, and wherein a frequency difference between the first and second resonator of the sensor device is used as a measure for the redox state of said anode or said reaction surface. However, it would be obvious to one of the ordinary skill in the art to utilize more than one resonator in Miller in view of Hallum because one would be able to obtain more data in order to perform a better measurement. Considering Miller's teaching with regards to frequency or resonance change of the coating, the frequency difference between the first and second resonators would be empirically determined to infer the redox state of the anode gas flow as discussed in claim in the rejection of claim 22.

Regarding claims 27 and 38, Miller in view of Hallum discloses the operating equation for response of the sensor includes a concentration of toxic gas (sensed fluid component) term, a flow rate term, and a water term, with additional noise terms for pressure and temperature (col. 13, lines 10-15). Miller further discloses in some instances, the gas being monitored for the presence of a specific hydride may contain other hydride species, or more generally, the coating material used in the sensor may be chemically reactive with a number of species in the gas (col. 13, lines 63-67).

Regarding claims 31-32, Miller does not particularly disclose the sensor is placed in the anode gas of the high-temperature fuel cell. Hallum discloses fuel cell system 20 includes a sensor 80 in fluid communication with gases flowing through lines 40 and 50. Therefore, it would have been obvious to one of the ordinary skill in the art to utilize in Miller the techniques of Hallum by placing the resonator in the anode gas space of

the cell in order to regulate the flow of anode gas flowing in inlet from anode gas supply to fuel cell stack thereby, monitoring the gas flow more effectively. Regarding claim 32, Miller discloses metal species sensor material comprises a metal oxide (col. 23, lines 16-17).

Regarding claims 33 and 39, Miller in view of Hallum discloses coating procedures utilizing the sol gel method must take into account rearrangement of the sol gel over time, in the binder (SiO.sub.2) prepared by the polymerization process (col. 19, lines 29-31).

Regarding claims 34 and 36, Miller discloses the piezoelectric sensor device is positioned on the outlet side of the gas flow of the cell (see: Fig. 1)

Regarding claim 35, Miller does not particularly disclose the sensor is placed in the anode gas of the high-temperature fuel cell. Hallum discloses fuel cell system 20 includes a sensor 80 in fluid communication with gases flowing through lines 40 and 50. Therefore, it would have been obvious to one of the ordinary skill in the art to utilize in Miller the techniques of Hallum by placing the resonator in the anode gas space of the cell in order to regulate the flow of anode gas flowing in inlet from anode gas supply to fuel cell stack thereby, monitoring the gas flow more effectively.

7. Claims 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schoenfer (US Patent 5,958,787) in view of Hanson (US Patent 6,955,787).

Regarding claims 41-42, Schoenfer does not particularly disclose wherein the first resonator is configured as a BAW resonator with an oxidizable and reducible coatings on both opposite surfaces. Hanson discloses the quartz resonator 40 is a

resonator formed of a piezoelectric material and as noted supra, the resonator can operate as a bulk acoustic wave (BAW), surface acoustic wave (SAW), or Love mode device (col. 2, lines 59-61). Hanson discloses a different coating 17 can be used on each BAW resonator plate 12 in order to detect different target agents. It would have been obvious to one of the ordinary skill in the art to utilize in Schoenfer the BAW resonator of Hanson because some of the BAW resonator plates will have been coated with a sensor coating, the sensor coatings having been collectively designed to differentially absorb to a specific chemical or biological agent, mass loading the resonator and giving off heat in the reaction thereby obtaining a better resonator to perform a reliable measurement and making the above combination more effective.

8. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (US Patent 5,827,947) in view of Hanson (US Patent 6,955,787).

Regarding claim 40, Miller does not particularly disclose or suggest the resonators are configured as BAW or Saw resonators. Hanson discloses the quartz resonator 40 is a resonator formed of a piezoelectric material and as noted supra, the resonator can operate as a bulk acoustic wave (BAW), surface acoustic wave (SAW), or Love mode device (col. 2, lines 59-61). Hanson further discloses an array 10 of BAW resonators. It would have been obvious to one of the ordinary skill in the art to utilize in Miller the BAW resonator of Hanson because some of the BAW resonator plates will have been coated with a sensor coating, the sensor coatings having been collectively designed to differentially absorb to a specific chemical or biological agent, mass loading the resonator and giving off heat in the reaction thereby obtaining a

better resonator to perform a reliable measurement and making the above combination more effective.

9. Claims 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schoenfer (US Patent 5,958,787) in view of Hanson (US Patent 6,955,787).

Regarding claims 41-42, Schoenfer does not particularly disclose wherein the first resonator is configured as a BAW resonator with an oxidizable and reducible coatings on both opposite surfaces. Hanson discloses the quartz resonator 40 is a resonator formed of a piezoelectric material and as noted supra, the resonator can operate as a bulk acoustic wave (BAW), surface acoustic wave (SAW), or Love mode device (col. 2, lines 59-61). Hanson discloses a different coating 17 can be used on each BAW resonator plate 12 in order to detect different target agents. It would have been obvious to one of the ordinary skill in the art to utilize in Schoenfer the BAW resonator of Hanson because some of the BAW resonator plates will have been coated with a sensor coating, the sensor coatings having been collectively designed to differentially absorb to a specific chemical or biological agent, mass loading the resonator and giving off heat in the reaction thereby obtaining a better resonator to perform a reliable measurement and making the above combination more effective.

10. Claims 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al. (US Patent 5,827,947) in view of Hanson (US Patent 6,955,787) and further in view of Sarkar et al. (US Patent 6,893,762).

Regarding claims 29, Miller in view of Hallum does not disclose wherein the oxidizable and reducible coating of the first resonator is made from material identical

with the catalyst material of the anode of the high-temperature fuel cell or the catalyst material of the reaction surface of the reformer and wherein the oxidizable and reducible coating of the first resonator is made from nickel-cermet. Sarkar discloses

the inner electrode layer 16 may serve as the anode of the fuel cell 10, and as such, is made of a nickel (or copper) and cermet having a thickness of between 1 .mu.m to 20 .mu.m and preferably about 5 .mu.m. (col. 5, lines 42-44). It would have been obvious to one having ordinary skill in the art at the time of the invention to utilize in Miller inview of Hallum the techniques of Sarkar because Prior to the EPD, the anode material is in the form of a slurry; the slurry includes combustible particles that create a porous anode structure when sintered and the concentration and distribution of the combustible particles in the inner electrode layer are selected to provide the inner electrode layer 16 with a porosity greater than or equal to 15 vol. %, and preferably around 30 vol. %. In addition, the above combination would provide a similar material for the resonator and the fuel cell to perform effectively the claimed invention in a reliable manner. See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960) (selection of aknown plastic to make a container of a type made of plastics prior to the invention was held to be obvious); Ryco, Inc. v. Ag-Bag Corp., 857 F.2d 1418, 8 USPQ2d 1323 (Fed. Cir. 1988) (Claimed agricultural bagging machine, which differed from a prior art machine only in that the brake means were hydraulically operated rather than mechanically operated, was held to be obvious over the prior art machine in view of references which disclosed hydraulic brakes for performing the same function, albeit in a different environment.).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to J M. SAINT SURIN whose telephone number is (571)272-2206. The examiner can normally be reached on Mondays to Fridays between 9:30 A.M and 6:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron L. Williams can be reached on (571) 272-2208. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jacques M SAINT SURIN/
Primary Examiner, Art Unit 2856
June 22, 2008